highest reading of the barometer reported was 30.52, at Wauseon, on the 25th, and the lowest, 29.55, at Jefferson, on the 4th. The monthly range was 0.96.

Temperature.—The mean temperature was 49°.3, which is 3°.1 below the five years' average, 3° below the normal for the month, and is the lowest for the month of October since the opening of the bureau. The highest temperature was 89°.8, at Logan, on the 7th, and the lowest, 11°.5, at Waverly, on the 31st. The monthly range was 78°.3, which is 9°.2 below the mean range for the past five years.

Precipitation (in inches).—The most noticeable feature of the weather was the unusually small rainfall. The mean for the state was 0.75; this is 1.62 below the five-year average, and is less than one-third the normal amount. General, though light, rains occurred throughout the state on the 3d, 9th, 10th, 11th, 23d, and 29th, and in the northern section on the 1st, 2d, 4th, 5th, 21st and 22d. The greatest rainfall reported was 3.55, at Jefferson, and the least, 0.11, at Springborough. The drought which began in June continued throughout October, and as a consequence many of the small streams and wells have dried up, and the rivers are very low, causing serious interruption to business, many furnaces being closed for want of water. The low stage of the water has also caused much sickness, typhoid fever being prevalent in many parts of the state.

Average number of clear days, 12.2; average number of fair days, 9.0; average number of cloudy days, 9.8; average number of days on which rain or snow fell, 3.7; least number of days on which rain fell, 1, at New Bremen; greatest number of days on which rain fell, 14, at Cleveland (Hyde); mean monthly rainfall, 0.75; average daily rainfall, 0.24.

Prevailing direction of the wind, southwest.

"Oregon Weather Service," report prepared by B. S. Pague, Private, Signal Corps:

A marked feature of the month has been the abnormally high temperature which continued until the 23d in the northern and central parts of the state, and along the coast, but on the date mentioned the temperature fell decidedly; the first killing frosts of the season being reported on the 23d and 24th; in the extreme southern and in the eastern portion the temperature continued high until the 15th, when killing frosts were reported from those regions, it was again high from the 17th to 23d. The maximum temperature occurred from the 3d to the 12th, the minimum on 23d and 24th. An unusually warm wave was felt at Bandon, on Coos Bay, on the 11th; it was very warm throughout the state on that day, but especially so there; the temperature rose to 86°, a very unusual feature. The observer reports an easterly wind; temperature of 58° at 6 a. m., 74° at 9 a. m., 86° at 12 m., and 62° at 6 p. m. The mean of the state is 51°.3.

Precipitation, (in inches).—The most marked feature of the month has been the great deficiency in the rainfall in all sections. A few showers occurred, the greatest number, 13, at Astoria; the least, 1, at Lakeview. The greatest deficiency occurred at Bandon, where it was 3.36; the least, 0.66, at Fort Klamath. For the season, from July 1st, the precipitation is below the average in all sections of the state.

The "Pennsylvania State Weather Service," report prepared under the direction of the Franklin Institute, Philadelphia, by Sergeant T. F. Townsend, Signal Corps, assistant:

The general climate of the state for October has been from 2° to 5° colder than usual, especially in the western and elevated counties. The cold of the 15th, 22d, 26th, and 31st was quite general, and nearly all the western and northern counties report snow on the 21st and 22d, in amounts from "ground covered" to one inch at Scranton and Wellsborough, and four inches at Greenville. Most vegetation was cut off throughout the state by the killing frost of September 26th, although in some of the eastern and southern counties, and in the lower valleys, the hardier sorts were continued until the severe frosts, which occurred during the latter half of October, and from which no district was free. An abundant growth of fall wheat and grass has been reported.

The colder belt of highlands had a mean of 45° at observing stations, and about 40° for the higher surfaces. The central counties had an average of 47° at observing stations, with a very considerable area of 50° in the valleys, and of 52° at West Chester, Swarthmore, Uniontown, Pottstown, and Carlisle, 53° at Pittsburg, and 55°.6 at Philadelphia, which is not a full degree below the average for a series of years. The mean at Erie was 48°.9, and therefore 4°.4 below the general mean of 53°.3.

The season at the lake shore was probably not so much extended as usual, owing to the severe frosts in September and October. None of these changes were either caused or attended by general storms of severity. The month was remarkably free from storms or floods, the rainfall being generally light. The southwestern part of the state is reported as very dry. In Westmoreland county the scarcity of water in wells and cisterns is causing much inconvenience. At several posts of observation, the rainfall was less than an inch, at Pittsburg, State College, Ridgway, McConnellsburg, Huntingdon, Indiana, Greenville, Washington, Greensburg. Catawissa, Charlesville, and Phillipsburg. Erie and Fallsington were exceptional, with 4.43 inches at Erie, and 3.06 at Fallsington. The number of rainy days varied from four to seventeen, the average for the state being seven. A severe wind storm from the southwest and west occurred at Greenburg, Greenville, Clarionville, Indiana, Meadville, and Scranton on the evening of the 23d. The general atmospheric movement for the month was rather less marked than usual, and no northeast storm occurred east of the Alleghanies, as often happens in October.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

Temperature (in degrees Fahr.).—Monthly mean, 61.4; highest monthly mean, 66.3, at Yemassee; lowest monthly mean, 55.9, at Kirkwood; maximum, 91, at Spartanburg, on 11th; minimum, 30, at Chester, on the 31st; range for state, 61; greatest local monthly range, 56, at Chester, Kingstree, and Spartanburg; least local monthly range, 38, at Yemassee; greatest daily range, 41, at Yemassee, on the 7th; least daily range 3, on the 20th, at Beaver Mine.

Precipitation, including melted snow (in inches).—Average for the state, 5.96; greatest, 10.11, at Cheraw; least, 2.50, at Jacksonborough; average number of rainy days, 8.5.

Wind.—Prevailing direction, north.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

October was characterized by the large percentage of clear or fair weather and the almost total absence of electrical disturbances. The other features showed but slight departures from the normal. The cold wave which passed over the state on the 5th resulted in a light frost in the eastern and middle divisions. Altogether, the month was a delightful one.

The mean temperature was 55°.9, slightly below the normal October mean of the past five years. The maximum temperature observed was 90°, recorded on the 10th, and was the highest October maximum during the five years, except in 1884, when it reached 99°. The minimum temperature was 22°, recorded on the 31st, and was, together with the October minimum in 1884, the lowest in the above corresponding period. The monthly range of temperature was the greatest October range during the above period, except in 1884. There were three cold-wave predictions during the month, viz., 4–5th, 24–25th, and 29–30th, all of which were fully verified.

The mean precipitation for the month was 2.57 slightly below the normal of past five years. Of this amount the eastern division received an average of three and a quarter inches, the middle division two and a half inches, and the western division, two inches. The greatest rainfall was 5.60 inches, reported at Fostoria, and the least was 1.22 inches, reported at Milan. The greatest rainfall in twenty-four consecutive hours was 3.30 inches, reported at Fostoria, on the 19th. The first half of the month was almost rainless, slight showers being reported on the 1st, 10th, and 11th. From the 17th to the 25th, inclusive, nearly all the rain of the month was received, the rains of the 17th, 24th, and 25th being general, the others mostly local, and generally light. The heaviest rain of the month fell on the 24th. About fifteen days were without measurable rainfall. Frosts were reported on about ten days, several of these, notably on the 12th, 13th, 22d, and 31st, were killing frosts, the others mostly light. Dews were reported on about eight days. On the 30th there was a very slight fall of snow in the eastern and middle divisions; the greatest amount fell at Greenville, but at most of the other stations it was scarcely noticeable.

Prevailing wind, north.

NOTES AND EXTRACTS.

DIRECTION OF MOVEMENT OF AREAS OF LOW PRESSURE.

[By 2d Lieut. F. M. M. BEALL, Signal Corps, Assistant.]

An examination of the prevailing meteorological conditions in the vicinity of low areas will develop certain characteristics usually found with all areas of low pressure, such as a general movement of the air in the vicinity around, and inclined towards the centre of, the low area; the highest temperature in the east or south quadrants and the lowest in the west or north; the presence of cloud and rain in certain portions of the area and fair weather in others, etc.

Now, if these characteristics are uniform attendants upon areas of low pressure, it will be practically an easy matter, in studying the tri-daily charts of the Weather Bureau, to draw conclusions in reference to the probable weather conditions at some future period, provided we are able to correctly define the paths the low areas will pursue.

The several forces which seem to influence the direction of movement of low areas in the United States appear to be:

(1.) The general drift of the atmosphere.
(2.) Unequal results of centrifugal force on all sides of the area.
(3.) Unequal condensation of vapor at all points within the area.
(4.) Unequal temperature changes in the vicinity of the area.
(5.) Unequal pressure changes in the vicinity of the area.
(6.) Attraction by neighboring areas of high barometer.
(7.) Unknown influences.

(1.) Over the region of the United States the general drift of the atmosphere is toward the east, and any abnormal disturbance prevailing within its limits will be affected by this motion and eventually conform to its direction, although superior forces may often cause a low area to temporarily take an opposite course.

(2.) The circulation of the air around a low area, from right to left and inclined towards the centre, can be seen illustrated upon any weather chart having a well-defined area of low pressure. This circulation immediately becomes subject to centrifugal forces, and the tendency of the revolving air to fly away from the centre is apparent. On the east side of the low area the air passes over points of latitude having an easterly motion less than its own, which causes it to move to the right or east. On the west side the conditions are reversed and the air is thrown to the west, which is also to the right. That on the north and south sides is similarly deflected to the right. This deflecting force being greater on the north side than on the south, increasing as the sine of the latitude as we go northward, the greatest outward pressure will be on the north side, and the consequent tendency of the whole area to move in that direction. This deflecting force toward the north, taken in connection with the eastward drift, gives the area a direction between east and north.

(3.) The condensation of the cloud vapor about the low area, and the consequent liberation of latent heat, generates a force of importance. The liberated heat expands and increases the ascending capacity of the surrounding air, which rises and makes room for more. This permits the outside air to move in and supply the deficiency. The rate of condensation in the several parts of the low area varies. At the point where the greatest condensation takes place should be found the greatest inflow of air, on account of liberated heat. The centre of the low area and the point of greatest precipitation do not usually coincide, but as the condensation of vapor and expansion of the air cause a reduction in pressure at that point the area of low pressure will be influenced by the reduction and move in that direction, provided other and superior forces do not exercise greater influence. When the other forces are normal or coincide with that caused by vapor condensation the influence is very marked in cases of heavy precipitation.

(4.) In addition to the effect of temperature changes mentioned under (3), we will consider such other changes as may be due to direct heating of the air near the earth's surface from other causes than that of condensation of vapor. The cloud envelope which is usually found over and about a low area, shields the earth from the direct rays of the sun during the day and retards radiation during the night. Around the margin of, and at broken places in, this envelope the sun will often raise the temperature decidedly above that in the immediate vicinity. This unequal temperature has a similar influence upon the low area as noted in (3), concerning similar conditions caused by the liberation of latent heat.

(5.) We have seen in (3) and (4) that the temperature of the air about a low area is increased at points in several ways, unless confined this temperature increase causes a decrease of pressure, also a cooling of the air in the rear quadrant of the low area is generally attended by an increase of pressure. Considering a low area as a mass of air out of equilibrium, with the greatest departure at the centre, and introducing these temperature disturbances of pressure we at once see that the points of pressure changes must exert an influence in disturbing the equilibrium. In the natural attempt to restore a mean pressure each disturbing factor exerts itself in proportion to its intensity, and we will find the direction of the low area affected accordingly.

(6.) The influence of a high area upon a low area in its vicinity is often quite noticeable and should be taken into consideration, especially if the gradient between them is more than a tenth of an inch to two hundred miles. The high area seems to have a slight attraction for the low, and the direction of the latter will often be slightly bended from its normal course. For instance, if the high area is south of the low the course of the latter will be more easterly, and if north of the low its course will be more northerly than its normal direction.

(7.) We sometimes find the low area will move in directions which the apparent forces do not justify. Such movements may be attributed either to influencing conditions prevailing beyond the field of observation, or to forces which available observations do not show.

It is not intended to convey the impression that these modifying influences of the movement of low areas are always apparent, but that one or more of them may be recognized upon any weather chart having a well-defined area of low pressure.

Record of temperature and precipitation at Wallingford Conn., from 1856 *to* 1887, *inclusive, from observations made by B. F. Harrison and B. H. Catlin.*

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.	Temperature (Fah.)	Precipitation.
	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.	Mean	Inches.
	°		°		°		°		°		°		°		°		°		°		°		°	
1856..	.....	.....	.....	.....	.....	.....	.....	4.10	.....	6.85	.....	3.07	.....	2.93	.....	**11.68**	.....	3.22	.....	1.98	.....	2.67	.....	6.61
1857..	.....	4.39	.....	2.08	.....	2.47	.....	7.11	.....	7.76	.....	3.23	.....	8.29	.....	5.62	.....	3.17	.....	5.88	.....	2.06	.....	5.79
1858..	.....	3.13	.....	1.92	.....	1.57	45.8	3.87	53.2	2.62	68.3	5.08	69.5	3.26	66.0	4.02	6c.8	5.18	52.8	3.29	34.5	3.23	28.3	4.47
1859..	25.4	6.94	29.0	4.24	39.8	8.24	44.6	3.76	58.0	4.73	63.3	6.25	68.1	2.58	67.6	6.12	58.7	5.63	46.8	1.91	41.3	2.49	25.3	4.01
1860..	26.9	2.38	26.2	3.13	37.4	2.62	44.1	2.11	57.0	4.04	65.4	1.90	67.9	2.72	69.5	5.53	59.5	3.38	50.5	3.10	43.0	6.37	29.0	4.97
1861..	23.7	4.07	32.0	2.90	34.2	5.02	46.6	5.83	53.0	5.67	65.3	3.68	69.8	2.85	66.6	5.66	61.8	4.61	54.6	2.40	39.4	4.47	31.5	1.77
1862..	24.6	5.71	24.5	3.01	33.2	4.30	44.3	1.93	57.2	2.93	63.3	7.60	68.0	5.28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1864..	23.2	.....	27.4	.....	32.6	.....	41.4	.....	57.8	.....	62.2	.....	67.0	.....	67.4	.....	56.8	.....	48.4	.....	47.1	.....	30.5	.....
1865..	21.8	4.92	27.9	4.60	40.6	6.31	49.6	3.26	58.5	7.26	68.4	4.89	71.5	6.84	67.0	1.57	67.7	1.38	50.0	4.33	43.3	3.15	34.6	4.01
1866..	27.2	1.71	31.7	6.48	36.3	3.41	52.2	2.89	57.8	5.80	69.6	4.31	74.0	3.28	65.5	4.21	63.0	6.17	51.0	3.35	42.8	4.96	30.3	4.38
1867..	22.0	2.42	34.7	2.64	34.0	4.08	47.6	2.76	55.9	6.31	66.6	5.40	69.0	2.45	69.9	10.53	60.7	2.59	51.3	5.91	41.0	3.50	25.3	2.70
1868..	23.0	4.55	16.7	1.69	35.5	2.66	42.3	5.58	55.4	**7.79**	65.0	3.67	74.3	2.44	70.0	7.27	61.0	**8.40**	47.1	0.93	39.2	4.31	25.7	2.47
1869..	31.0	3.05	30.0	5.22	30.1	7.02	47.0	2.16	55.8	6.36	65.8	3.23	70.0	2.98	67.8	1.95	62.7	3.27	48.0	**13.20**	38.4	3.58	30.3	6.35
1870..	33.2	6.38	27.1	5.19	23.0	5.60	48.4	6.21	59.0	1.39	70.9	3.12	74.0	2.96	71.8	2.11	63.0	1.40	55.6	5.37	43.3	3.43	32.4	2.19
1871..	25.3	3.88	27.2	3.99	41.0	6.54	.....	.....	.....	.....	.....	.....	70.2	**2.03**	73.0	7.04	58.3	2.02	54.1	5.55	37.2	4.62	28.1	3.23
1872..	27.8	1.47	26.6	2.99	27.5	4.16	46.5	1.72	59.8	3.60	69.5	4.23	74.4	5.02	73.1	6.96	64.0	4.31	50.4	2.70	39.1	5.38	23.4	3.66
1873..	23.1	**6.71**	26.0	3.52	32.9	2.50	45.0	3.28	57.2	5.42	67.3	**0.38**	72.5	2.17	69.2	9.93	62.5	2.16	51.3	5.03	33.9	4.36	32.0	4.84
1874..	.....	6.51	.....	3.88	.....	1.53	.....	**7.88**	.....	3.78	.....	1.93	.....	4.54	.....	7.13	.....	3.29	.....	**1.20**	.....	3.12	.....	2.32
1875..	.....	2.90	.....	5.18	.....	5.48	.....	3.74	.....	2.12	.....	3.37	.....	3.21	.....	4.88	.....	2.10	.....	3.32	.....	5.72	.....	**1.37**
1876..	.....	**1.36**	.....	5.26	.....	**10.90**	.....	4.98	.....	3.61	.....	1.40	.....	**10.01**	.....	1.69	.....	5.00	.....	1.43	.....	4.37	.....	4.19
1877..	.....	3.47	.....	**1.50**	.....	8.30	.....	2.35	.....	1.07	.....	6.59	.....	2.35	.....	4.63	.....	**0.65**	.....	8.34	.....	**6.81**	.....	1.76
1878..	.....	5.83	.....	5.71	.....	2.95	.....	4.73	.....	3.44	.....	3.97	.....	3.40	.....	3.96	.....	4.87	.....	2.73	.....	5.87	.....	7.06
1879..	.....	2.64	.....	3.88	.....	4.93	.....	5.80	.....	2.32	.....	3.90	.....	8.99	.....	8.04	.....	1.80	.....	1.30	.....	2.00	.....	4.19
1880..	.....	4.02	.....	3.79	.....	3.63	.....	4.59	.....	1.16	.....	2.04	.....	5.38	.....	4.62	.....	3.86	.....	3.89	.....	2.87	.....	3.00
1881..	.....	6.39	.....	6.97	.....	7.79	.....	1.35	.....	4.51	.....	3.54	.....	3.07	.....	1.82	.....	0.68	.....	2.99	.....	4.06	.....	4.89
1882..	.....	5.98	.....	4.59	.....	4.14	.....	**1.23**	.....	4.51	.....	2.46	.....	2.43	.....	1.51	.....	11.90	.....	3.63	.....	**1.62**	.....	3.86
1883..	.....	4.81	.....	5.56	.....	2.58	.....	1.91	.....	3.95	.....	2.24	.....	5.05	.....	**1.03**	.....	2.56	.....	6.51	.....	1.77	.....	4.33
1884..	.....	5.16	.....	6.06	.....	5.40	.....	2.98	.....	3.94	.....	4.52	.....	3.92	.....	5.32	.....	0.91	.....	3.40	.....	2.73	.....	**7.52**
1885..	.....	5.27	.....	4.17	.....	**1.52**	.....	2.72	.....	3.07	.....	1.91	.....	3.04	.....	7.96	.....	0.75	.....	5.59	.....	5.05	.....	4.25
1886..	.....	5.37	.....	**8.77**	.....	3.67	.....	4.20	.....	3.72	.....	2.78	.....	4.23	.....	3.23	.....	2.98	.....	2.73	.....	4.68	.....	5.93
1887..	.....	5.71	.....	7.16	.....	5.05	.....	3.19	.....	**0.25**	.....	**8.12**	.....	4.53	.....	4.77	.....	2.12	.....	3.25	.....	.....	.....	.....

Maxima and minima temperatures at Wallingford, Conn., from 1864 *to* 1878.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1864..	48	—10	44	2	52	12	69	18	76	32	.....	44	90	25	78	44	74	42	68	.....	68	20	.....	.....
1865..	40	4	46	10	58	20	77	31	80	44	88	37	89	52	88	50	87	42	80	30	65	24	54	12
1866..	45	— 1	56	10	63	20	82	30	80	44	89	59	94	58	84	48	85	44	70	31	63	24	53	9
1867..	43	0	57	14	53	7	68	32	77	38	85	48	87	56	84	46	72	41	74	30	67	20	50	0
1868..	40	.....	40	—14	58	0	68	22	72	36	86	48	92	61	86	52	85	36	70	22	61	24	40	7
1869..	48	6	54	9	60	0	74	28	86	38	81	45	90	52	91	50	84	34	72	24	60	23	46	0
1870..	52	6	51	.....	52	.....	74	28	84	40	90	52	92	58	91	50	84	40	75	29	62	26	53	1
1871..	52	— 6	54	— 8	58	30	.....	.....	.....	.....	.....	.....	84	49	86	50	76	40	73	29	62	12	48	— 2
1872..	45	2	46	6	48	1	82	30	85	49	88	48	91	64	87	54	88	42	72	31	58	14	44	—11
1873..	46	20	46	— 3	48	3	67	34	80	36	97	50	90	58	88	55	84	42	72	30	55	14	58	12

ATLANTIC WEATHER CHARTS

[Extracts from London Nautical Gazette, vol. 56, page 296, 1887.]

The Meteorological Council have for some time past been engaged in the preparation of synchronous weather charts of the north Atlantic and the adjacent continents for every day from 1st August, 1882, to 31st August, 1883, * * * * and for each day they have given two separate charts—one to show the barometric pressure, the wind, and the weather; the other to show the temperature of the air, and the sea, and the weather. The observations have been collected from a very large number of ships, and they supply the means of exhibiting, with very considerable precision, the principal elements of the weather for every day during the period * * * *. The period embraced is that during which the international system of circumpolar observations was being carried out, and observations have thus been obtained from very high northern latitudes, which could not otherwise have been procurable, and, consequently the results embodied in the charts have not only been rendered far more complete, but are of an exceptional value, not likely to be soon equalled. * * * * The study of the weather of western Europe for many years has established, in a manner that is beyond question, that the atmospheric disturbances, on which the changes of weather are in a great measure, if not mainly, dependent, reach our western coasts after having passed for a longer or shorter distance over the Atlantic. * * * *. The feature which probably stands out in greater prominence than any other in these charts is the general movement from west to east of the storm-centres or depressions in the middle latitudes, a confirmation of the law which has been for some time fully recognized * * * *. In addition to these travelling depressions or disturbances, there is a decided tendency in the winter months to a permanent area of low barometer in the vicinity of Greenland and Iceland, on the southern border or edge of which the disturbances travel * * * *. There is also a permanent area of high barometer, or anti-cyclone, situated in the mid-Atlantic; this area oscillates somewhat in position, at one time being pushed further north than at another, and sometimes similarly varying its situation to the east or west, and much of the intensity of the Atlantic storms is due to the position of this anti-cyclone, since they invariably skirt its northern edge, and the westerly winds on the southern side of a disturbance are greatly augmented in strength if the high pressure area is well to the north, causing, as this does, a greater barometrical difference over a given area. The charts show how, when this area of high barometer readings extends farthest to the northward, the storm-centres of necessity take this route in a higher latitude across the Atlantic, and if they strike the coasts of Europe at all, they touch a very northerly point, and affect but slightly the weather of the British Islands. If, however, this anti-cyclonic area has a position farther to the southward, the storm systems also keep in a more southerly latitude, and are more likely to take a direct route for the British Islands. * * * * At times this Atlantic high-pressure area will extend to the coasts of Spain and France and even to the British Islands; in the latter case we enjoy a period of almost complete immunity from storms, although with these conditions prevailing on the European side of the Atlantic the atmosphere is usually in a very disturbed condition near the American coasts—storms on that side being unusually prolific. It is under such conditions as we have just described that the American storm warnings most completely fail * * * *.

The charts exhibit in the clearest possible manner the very different conditions of weather which prevail over the Atlantic in summer to those of the winter, the changes in the latter season being more frequent and of more serious character. The weather systems in the summer, although they possess the same principal features as those which characterize the winter storms, are wanting in energy, probably the results of less difference of temperature over a given area, and also to the presence of less aqueous vapor, which constitutes so important a factor in storm development. The summer disturbances * * are often productive of much rain, but it is somewhat exceptional for these to be accompanied by winds of great force. In the winter months, on the contrary, gales are of every day occurrence on some part of the area embraced by the charts, and very often several disturbances existing at one time; on October 10th there are no fewer than six storm-centres over the Atlantic at the same moment, as shown by the synchronous chart for that day, and each of these was accompanied by winds of gale force * * * * * * * * *.

These charts afford to the navigator the most complete study of the weather. They show, in a graphic manner, how a vessel may be involved in a gale for days together; and how one gale after another is met with on a passage with scarcely a break of fine weather between them. They show that when very disturbed conditions are prevailing over the Atlantic, a vessel may be within an hour or two's sail or steam of bad weather, although there is no indication of the approach of such bad weather at the position of the ship.

* * * * The charts afford a bird's-eye-view of winds and weather over the north Atlantic and the adjacent continents, they show the meeting of the northeast and southeast trades; the southeast trade extending well across the equator into the northern hemisphere throughout the period, but its limit is shown to be several degrees farther north in August than in October and November * * * *. The charts show that in August the temperature of both air and sea in 35° north latitude is about 10° warmer on the western side of the Atlantic than on the eastern, whilst north of 45° N. the reverse is the case, the temperature contiguous to the coasts of England being decidedly warmer than in the same latitude on the Labrador coast, the latter difference becoming much more marked as winter is approached. The result of these differences is a very decided packing together of its isotherms on the western side of the Atlantic whilst they open out on the eastern side * * * *. There is a wonderful agreement between the temperature of the air and sea over the ocean, but at the end of summer the air temperature is slightly the warmer to the extent of 2° or 3°, but as winter is approached the sea is slightly warmer than the air.

Table of monthly mean temperatures at Lima, Ohio, from January, 1865, to October, 1887, inclusive, and monthly precipitation from January, 1881, to October, 1887, inclusive, from observations made by Mr. F. Y. Davis.

Temperature, in degrees Fahrenheit.

Year.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1865	17.1	28.5	41.9	51.8	60.1	73.0	70.3	68.2	70.8	68.5	37.1	29.8
1866	24.3	24.7	33.4	54.2	57.2	67.8	74.0	63.9	60.2	52.8	38.3	24.9
1867	16.3	32.8	30.3	49.6	52.8	71.7	72.3	71.5	66.7	53.2	43.6	28.0
1868	20.2	23.6	42.1	45.1	58.7	68.1	79.0	70.0	58.9	47.8	38.9	24.2
1869	31.8	31.3	31.5	46.9	57.6	66.8	71.2	72.4	63.7	42.2	33.0	30.0
1870	28.3	27.5	33.7	52.2	64.0	69.2	74.7	71.9	67.4	53.3	38.8	25.4
1871	29.7	31.6	45.3	53.9	63.0	69.9	71.1	73.1	60.0	54.0	35.5	24.7
1872	22.9	25.3	30.3	52.2	62.0	70.3	75.3	72.8	64.8	50.9	32.2	18.7
1873	21.3	25.7	33.9	48.4	61.9	72.4	72.4	71.4	61.5	47.3	32.6	33.3
1874	30.4	30.8	37.8	42.3	64.8	73.7	74.7	72.9	67.4	51.9	28.3	32.1
1875	17.6	17.5	33.9	45.2	60.2	67.1	71.9	66.3	59.9	48.5	36.0	37.2
1876	35.1	32.6	33.9	48.8	62.7	70.0	73.9	63.0	62.0	47.8	39.0	18.2
1877	22.4	23.8	32.3	50.5	57.6	68.1	72.6	71.5	63.4	54.7	38.8	40.3
1878	28.3	31.1	43.3	56.2	59.3	65.3	74.6	71.9	63.0	50.4	39.9	22.2
1879	20.4	24.4	28.3	48.4	63.2	68.7	74.7	67.7	58.1	58.8	40.5	34.5
1880	42.1	37.1	39.1	52.2	67.6	71.4	73.4	72.7	63.5	50.0	31.7	23.1
1881	20.2	26.6	32.0	44.9	66.3	68.4	73.6	76.4	68.1	56.3	39.6	25.1
1882	28.7	38.4	40.1	52.0	63.7	66.9	68.6	73.7	64.2	56.8	42.6	27.8
1883	23.3	29.7	34.0	48.8	62.0	71.0	73.0	68.6	63.3	55.1	44.3	31.7
1884	18.1	31.7	37.7	48.9	60.7	74.8	75.2	71.5	69.7	58.5	36.7	28.7
1885	21.9	19.1	27.9	51.6	61.7	66.7	75.4	72.4	68.6	52.0	41.6	32.9
1886	24.3	29.8	40.1	57.8	63.8	74.1	74.0	74.1	68.5	54.6	39.8	23.8
1887	27.1	36.1	37.9	60.4	67.0	72.8	72.6	70.2	70.2	54.3	.....	.....

Precipitation, in inches.

1881	6.7	7.0	9.2	3.3	2.9	5.7	3.6	0.9	1.2	4.7	4.6	4.9
1882	2.2	4.0	3.3	2.0	5.1	4.7	2.9	7.6	1.2	2.6	3.2	3.0
1883	2.8	8.4	0.4	4.1	7.5	6.7	5.9	2.2	2.5	5.5	4.1	4.5
1884	3.7	5.6	2.3	3.0	3.9	1.8	4.4	2.6	1.9	1.4	2.2	4.2
1885	5.0	1.8	1.2	4.0	5.8	4.3	1.6	4.7	2.2	2.1	1.6	1.5
1886	3.1	1.6	2.4	3.6	4.2	2.8	0.4	6.2	4.9	1.6	3.6	6.8
1887	4.0	6.6	2.4	3.1	6.2	4.6	2.1	3.2	1.3	1.5	.....	.....

Total for 1881, 56.7; 1882, 41.8; 1883, 54.6; 1884, 37.0; 1885, 35.8; 1886, 41.2.

NOTE.—Observations of temperature were made at sunrise, 1 p. m., and sunset, and the mean is found by dividing the sum by three.

The following are extracts from a paper entitled "Notes on the climate of the Fiji Islands," S. 18° 30′, E. 179°, furnished Mr. George H. Boehmer, Chief Exchange Division, Smithsonian Institution, by Mr. W. H. Bruce, vice-commercial agent at Levuka, Fiji, and represent an uninterrupted series of monthly meteorological values obtained from observations taken during a period of eleven years by Mr. J. W. D. Vaughan, Her Majesty's storekeeper at Suva, Fiji. From January 1, 1875, to August, 1882, the observations were taken at Levuka, Fiji, and from August, 1882, to December 31, 1885, they were made at Suva, Fiji. The barometric values are corrected for temperature and instrumental error.:

Atmospheric pressure.

Month.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	Means for 11 years.
January	29.77	29.11	29.79	29.94	29.90	29.83	29.77	29.72	29.78	29.85	29.79	29.75
February	29.03	29.42	29.87	29.96	29.92	29.94	29.80	29.85	29.79	29.83	29.86	29.75
March	29.52	29.70	30.18	29.92	29.99	29.96	29.89	29.82	29.81	29.90	29.83	29.87
April	29.83	29.80	29.87	30.02	30.01	30.03	29.94	29.92	29.91	29.94	29.88	29.92
May	29.89	29.90	29.99	30.06	30.02	30.01	29.99	29.91	29.97	29.97	30.04	29.98
June	29.89	29.90	30.05	30.09	30.09	29.97	30.00	29.98	29.98	30.02	30.07	30.00
July	29.90	29.91	30.05	30.10	30.10	29.99	29.96	30.01	30.03	30.05	30.03	30.02
August	29.90	29.91	30.01	30.12	30.14	30.01	30.03	30.01	30.03	30.04	30.03	30.03
September	29.90	29.90	30.10	30.14	30.11	30.01	30.01	29.99	30.00	30.06	20.08	30.02
October	29.89	29.90	30.06	30.08	30.07	29.99	29.98	30.04	29.99	30.06	30.09	30.01
November	29.55	29.74	30.32	30.01	29.99	29.88	29.88	29.87	29.91	29.95	29.99	29.92
December	29.76	29.53	29.92	29.95	29.90	30.17	29.79	29.79	29.84	29.88	29.92	29.86
Means	29.74	29.73	30.02	30.03	30.03	29.99	29.92	29.91	29.92	29.96	29.96	29.93

Mean temperature.

January	82.0	82.0	82.0	82.0	81.0	82.0	83.0	82.0	83.0	80.0	81.0	81.8
February	82.0	84.0	82.0	82.0	80.0	81.0	81.0	83.0	80.0	80.0	83.0	81.6
March	80.0	81.0	81.0	81.0	82.0	82.0	82.0	81.0	82.0	82.0	82.0	81.5
April	79.0	79.0	80.0	79.0	81.0	79.0	82.0	82.0	80.0	79.0	81.0	80.1
May	79.0	78.0	82.0	79.0	80.0	80.0	78.0	80.0	78.0	76.0	77.0	78.8
June	78.0	77.0	75.0	77.0	78.0	78.0	79.0	78.0	75.0	76.0	75.0	76.9
July	76.0	75.0	74.0	75.0	78.0	76.0	77.0	75.0	74.0	73.0	74.0	75.2
August	78.0	75.0	72.0	75.0	76.0	76.0	77.0	80.0	74.0	73.0	71.0	74.3
September	78.0	76.0	74.0	76.0	77.0	75.0	79.0	77.0	75.0	73.0	72.0	75.6
October	79.0	77.0	76.0	76.0	78.0	77.0	80.0	78.0	76.0	76.0	75.0	77.1
November	79.0	78.0	79.0	78.0	80.0	79.0	83.0	81.0	79.0	79.0	77.0	79.3
December	80.0	78.0	81.0	80.0	80.0	81.0	81.0	83.0	79.0	82.0	80.0	80.4
Means	79.2	78.3	78.2	78.3	79.2	78.8	80.2	80.0	77.9	77.4	77.3	78.6

Monthly rainfall.

January	11.66	10.82	12.40	8.52	15.29	14.02	19.94	11.80	7.31	4.40	12.81	11.72
February	9.82	8.76	9.29	5.37	12.64	7.62	19.96	12.77	13.25	18.77	5.62	11.26
March	23.98	17.39	12.67	16.09	11.42	13.62	11.64	11.78	9.08	15.59	9.88	13.92
April	18.95	13.54	4.12	17.18	12.97	22.35	8.00	2.72	9.12	8.71	10.69	11.61
May	6.86	2.64	0.76	1.74	7.67	5.91	2.13	22.59	4.84	6.96	6.03	6.20
June	16.06	2.42	6.77	0.20	4.21	6.45	2.94	1.40	12.25	2.58	0.83	5.10
July	2.21	1.32	7.16	1.38	5.60	5.83	9.46	8.25	2.23	2.46	2.55	4.40
August	2.62	5.55	11.04	2.86	2.44	10.66	14.19	3.88	7.39	5.52	9.00	6.83
September	8.00	5.12	2.79	0.89	4.89	2.60	6.14	3.31	3.70	13.43	6.64	5.23
October	7.07	6.68	5.47	3.75	8.94	20.29	8.95	5.82	7.17	0.51	3.47	7.08
November	7.21	7.65	0.03	11.35	4.84	9.47	10.43	28.73	18.05	9.86	3.51	10.10
December	5.05	22.71	0.88	3.31	6.17	15.52	22.11	10.69	14.46	3.29	5.32	9.95
Totals	119.49	104.60	73.38	72.64	97.08	134.34	135.89	123.74	108.85	92.08	78.35	103.68